

ECAL DAQ – Status Update

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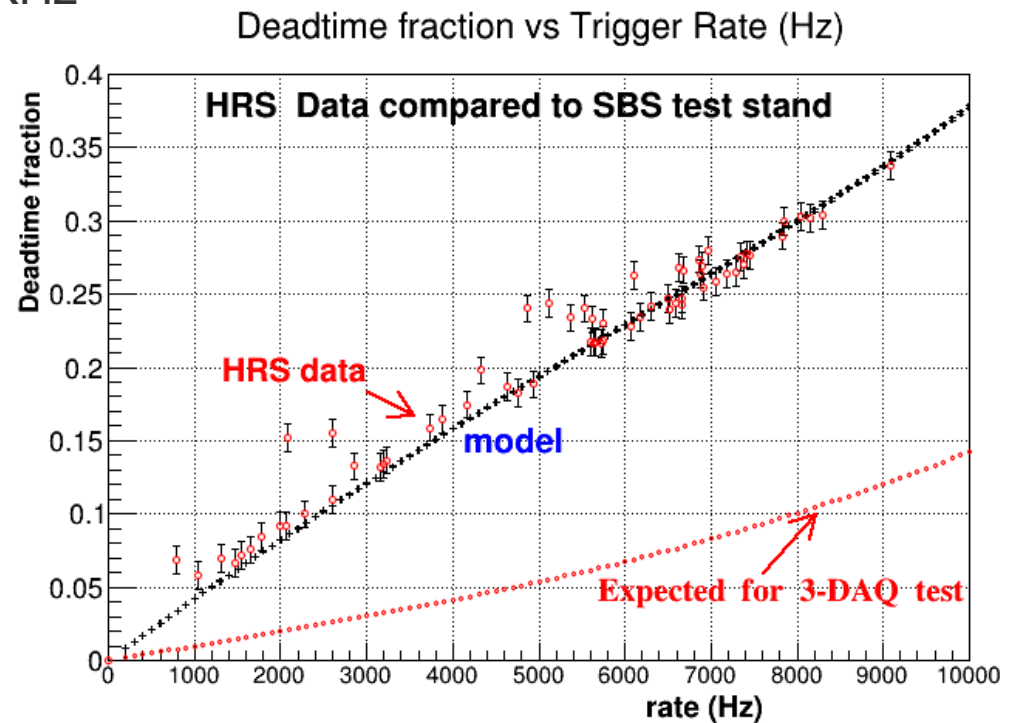
SBS Weekly Meeting
September 9, 2015

Electron Calorimeter for G_E^p

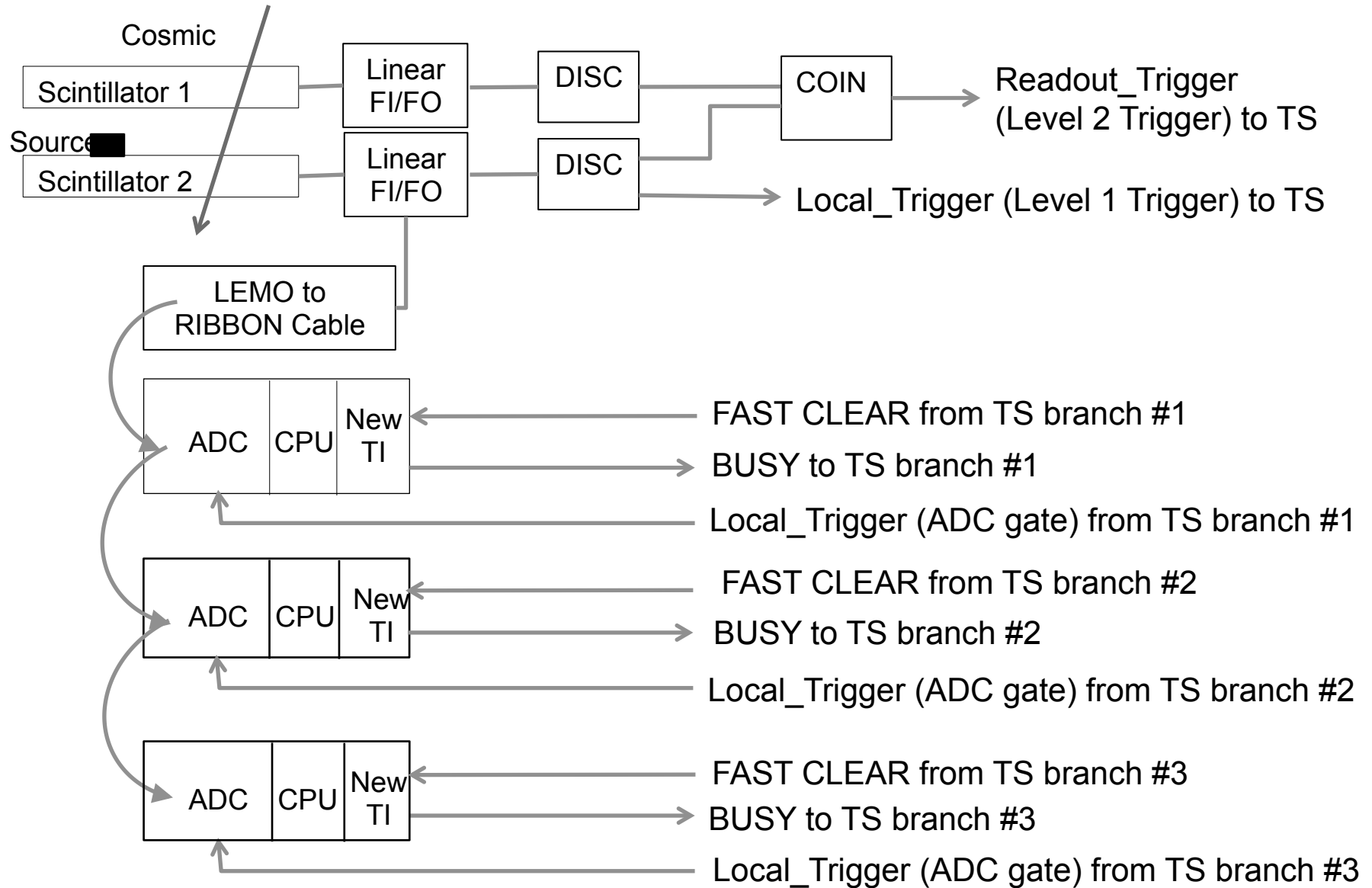
- G_E^p - Proton form factor ratio measurement up to $\sim 12 \text{ GeV}^2$ using recoil polarization method
- Trigger – Coincidence detection of elastically scattered electron and the recoil proton
 - Proton arm trigger rate $\sim 1.5 \text{ MHz}$
 - Electron arm trigger rate $\sim 60 \text{ KHz}$

Coincidence trigger rate $\sim 5 \text{ kHz}$

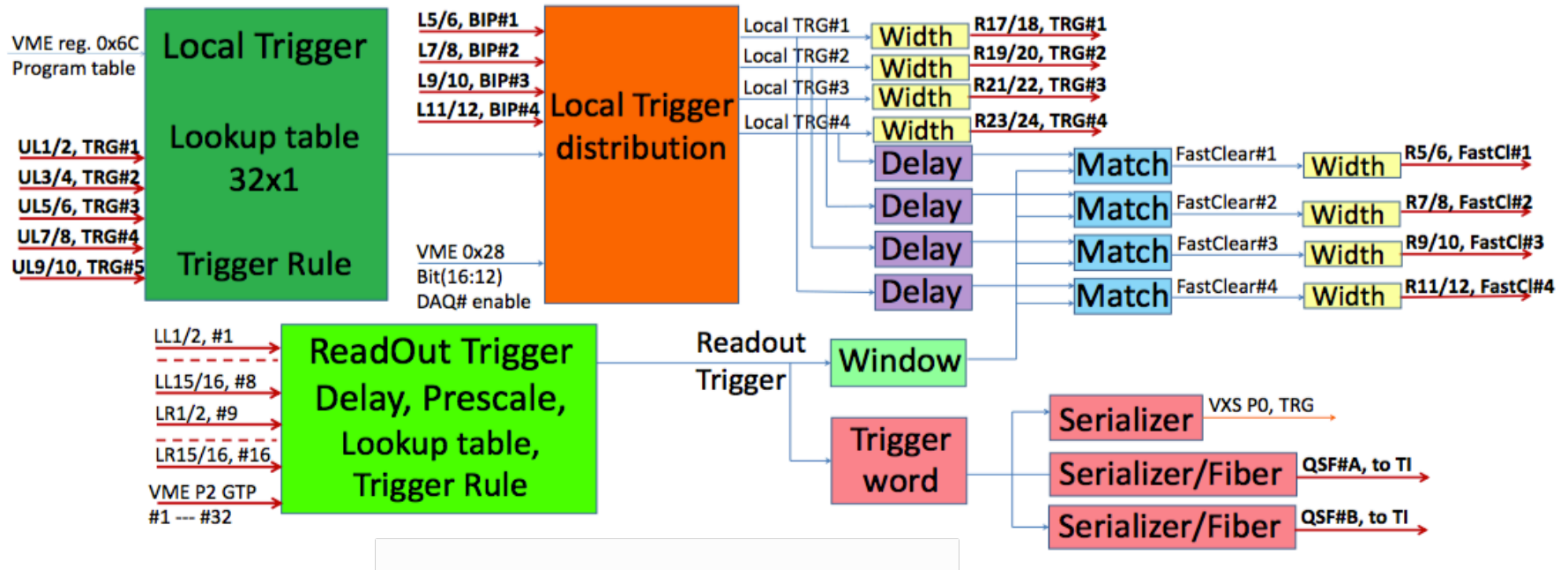
- $\sim 25\%$ dead time at 5 kHz .
- Need to reduce Fastbus dead time
- Event blocking and sparsification are already tested.
- The next is to switching trigger between multiple FB crates (module flipping – 3 DAQ test).



Current Plan for the Module Flipping Test



SBS Trigger Supervisor



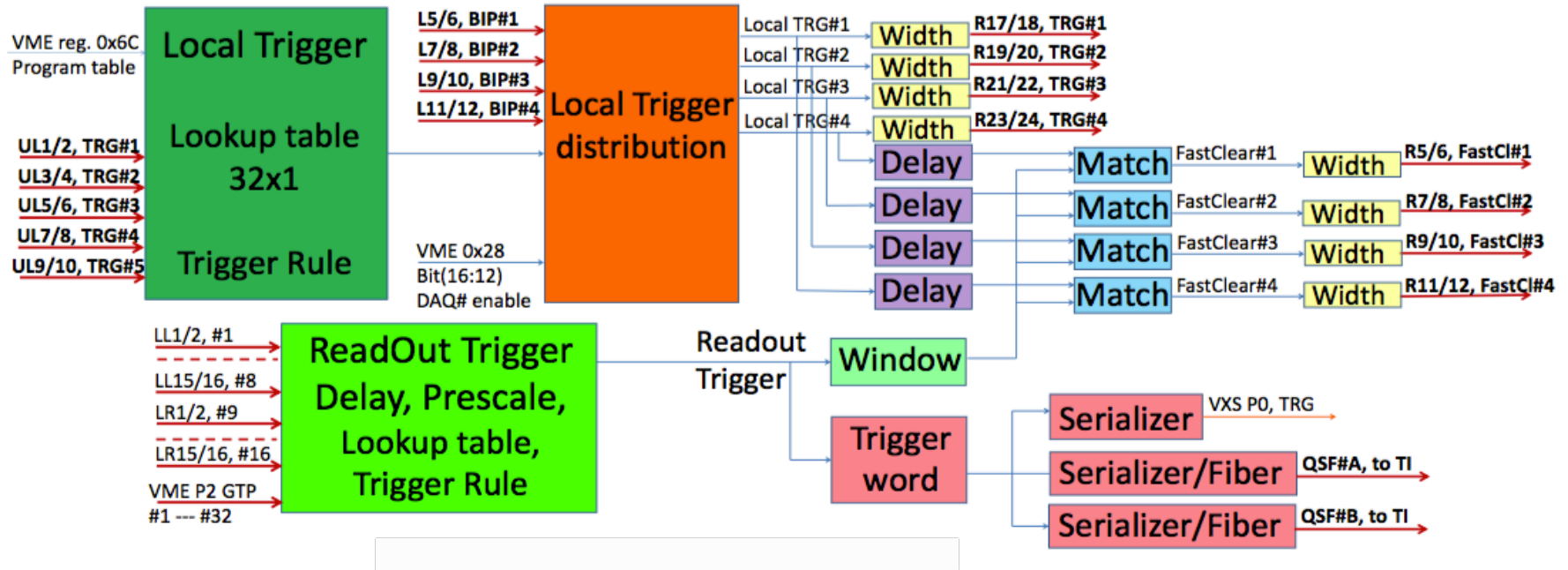
Local trigger (Level 1 Acceptance)

- Triggers are distributed among four duplication branches.
- If one branch is BUSY (CIP), TS will skip that branch and look for the next non-BUSY branch.

Readout trigger (Level 2 Acceptance)

- Distributed to all Tis.

SBS Trigger Supervisor



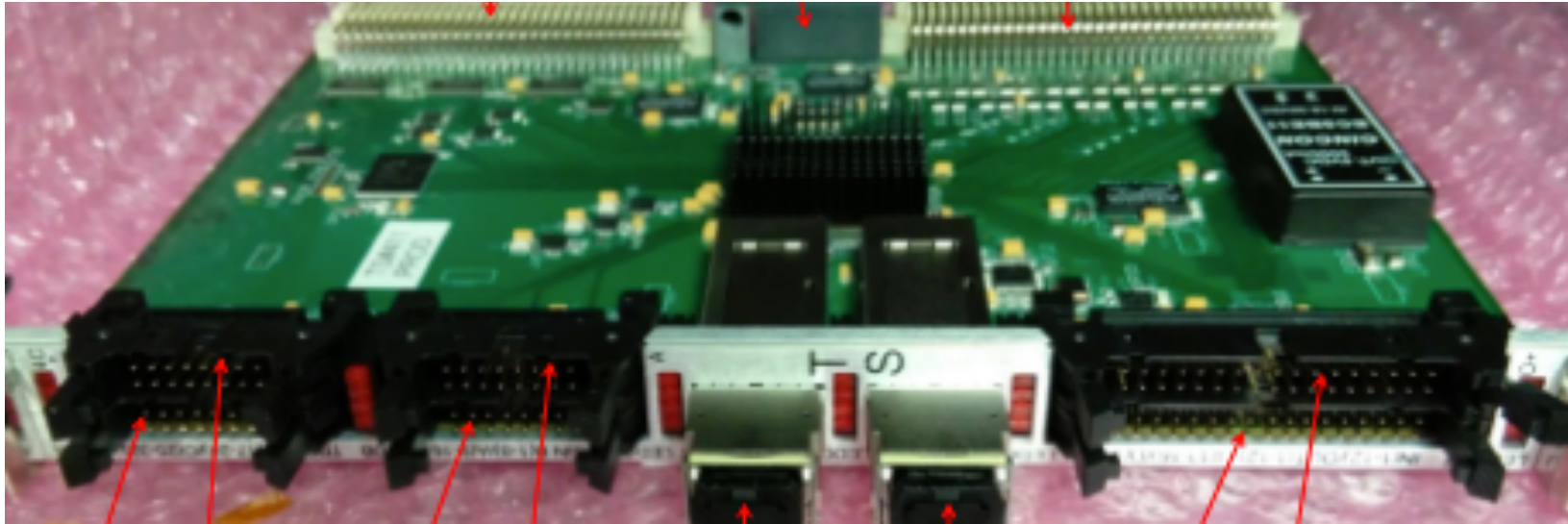
Four duplication branches

- Send local trigger (gate) to the Fastbus crate.
- Send fast clear signal to the crate
- Receive crate busy from the crate

Fast Clear signal

- Abort the ADC conversion to minimize the dead time.
- It is a delayed Local trigger vetoed by the Readout trigger.

SBS Trigger Supervisor

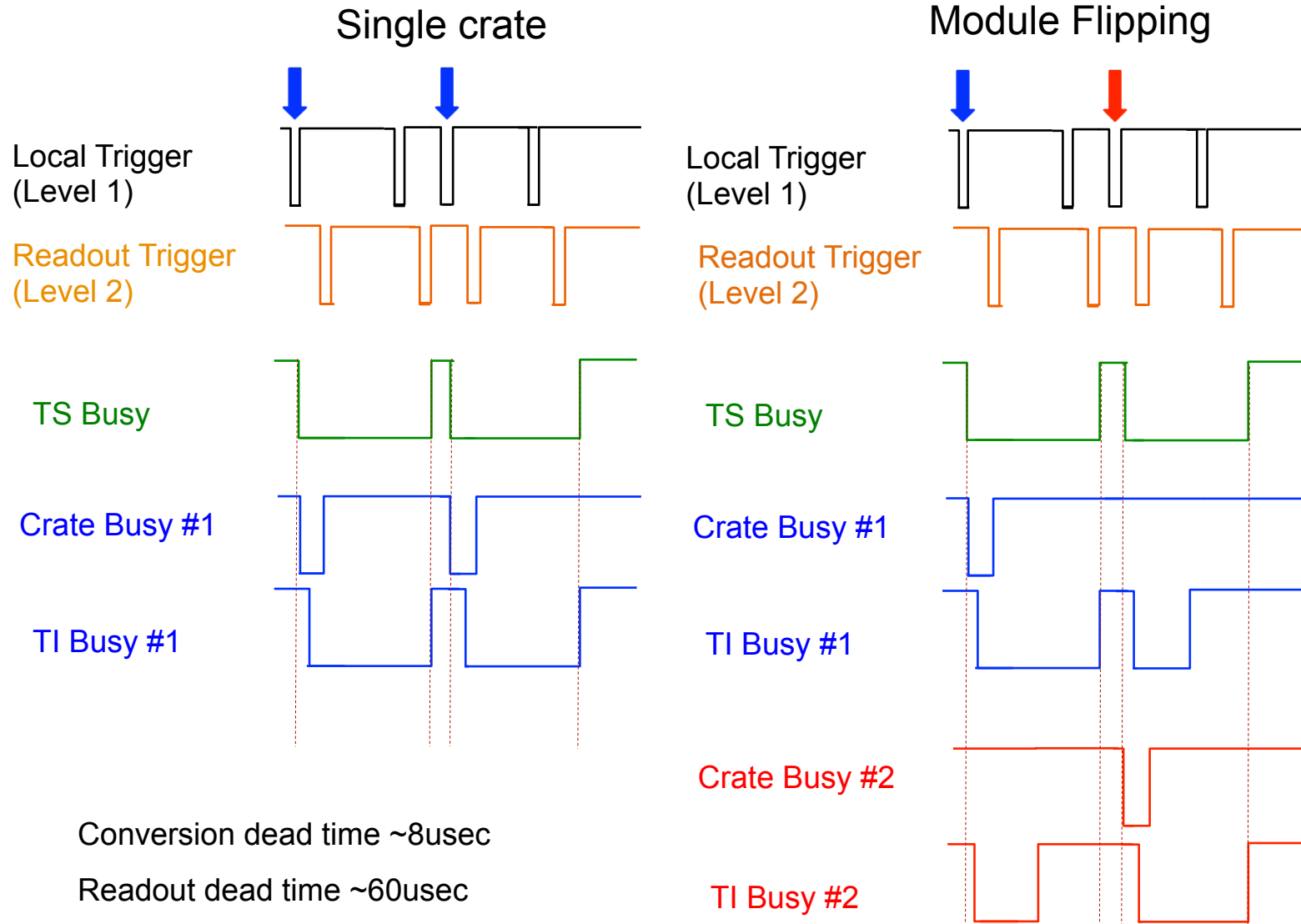


- 2 optical fiber optic ports to distribute trigger signals to the crates (TIs).
- Able to fan out to more Fastbus crates via SD, TD modules.
- The busy signals from frontend electronics can propagate back to the TS.
- Currently, use only two crate for module flipping test.

Work in Progress

- Set up the random trigger.
- Source – 25 uCi Sr-90
- Dead time – by a scalar (set up with new VME Linux CPU)
- New Trigger supervisor
 - Designed by William Gu.
 - Libraries and other scripts written by Bryan Moffit.
- Currently,
 - 6 Fastbus crates are ready for testing.
 - Each filled with 8 ADC.
 - Fastbus signal distribution cards to send the GATE, FAST CLEAR to the crates and BUSY signals back to TS.

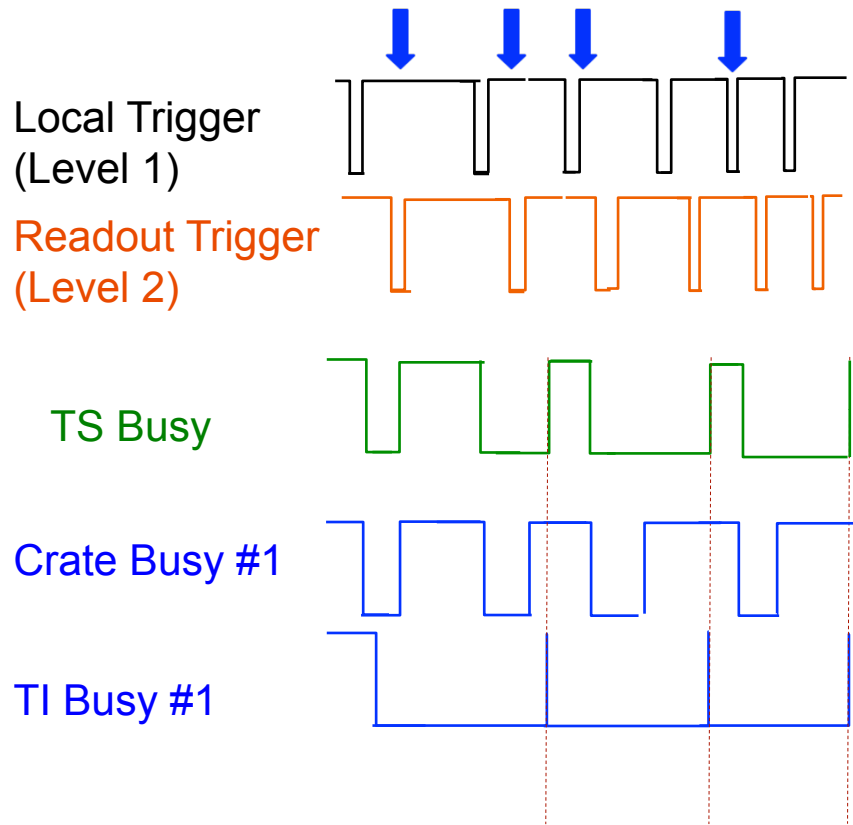
BUFFER LEVEL = 1 and Readout trigger = Local trigger



BUFFER LEVEL = 2

Readout trigger = Local trigger

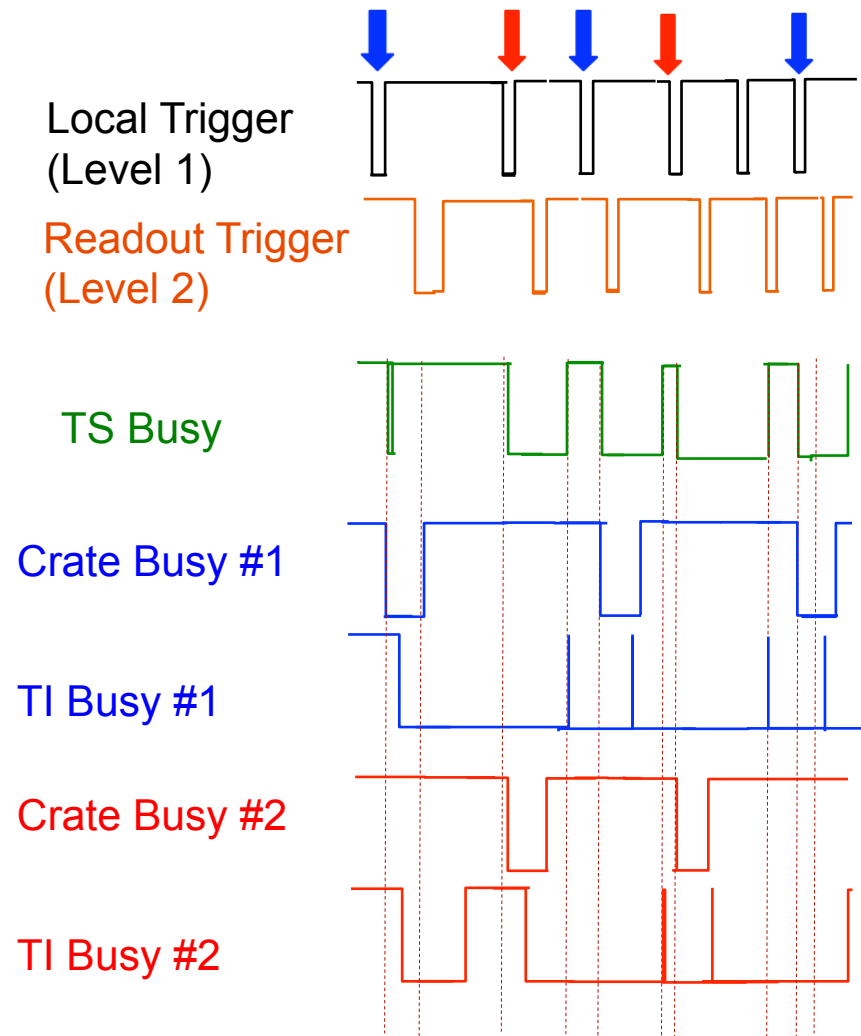
Single crate



Conversion dead time ~8usec

Readout dead time ~60usec

Module Flipping



Testing

- Local trigger = Readout trigger and with single crate
- TI data provide the which Fastbus duplication branch has data
- But there are “**Branch 0**” events.

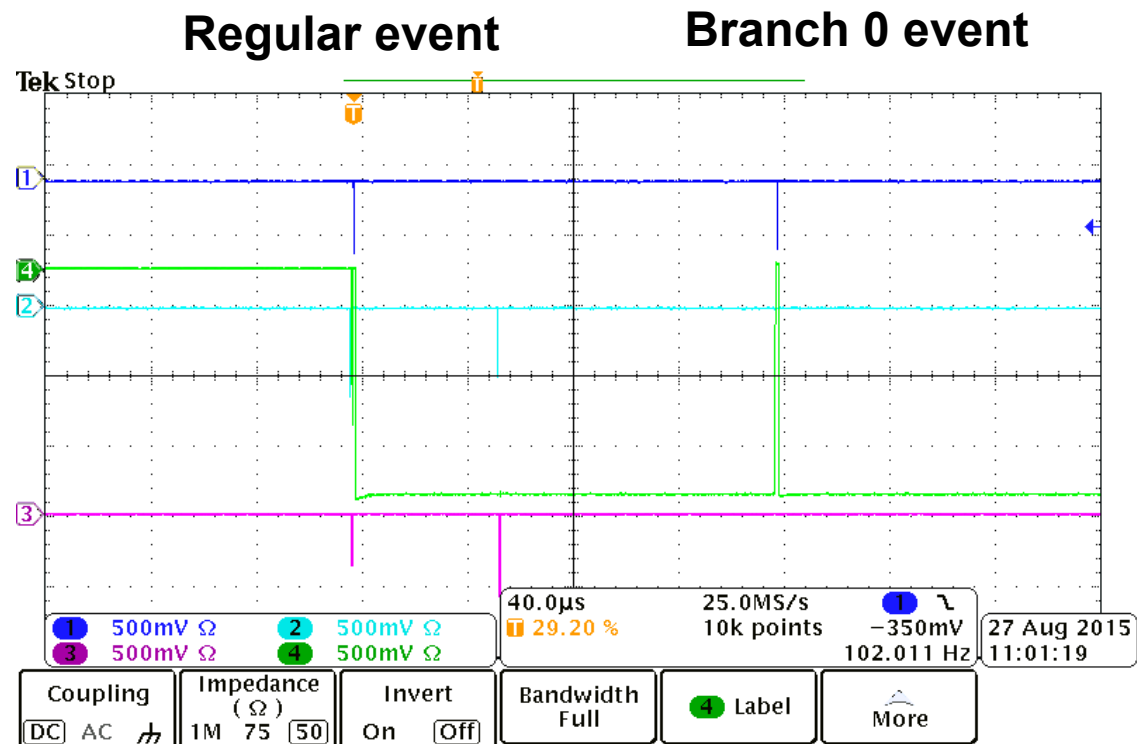
Readout trigger
output from TS

Busy from TI

Input local trigger
to TS

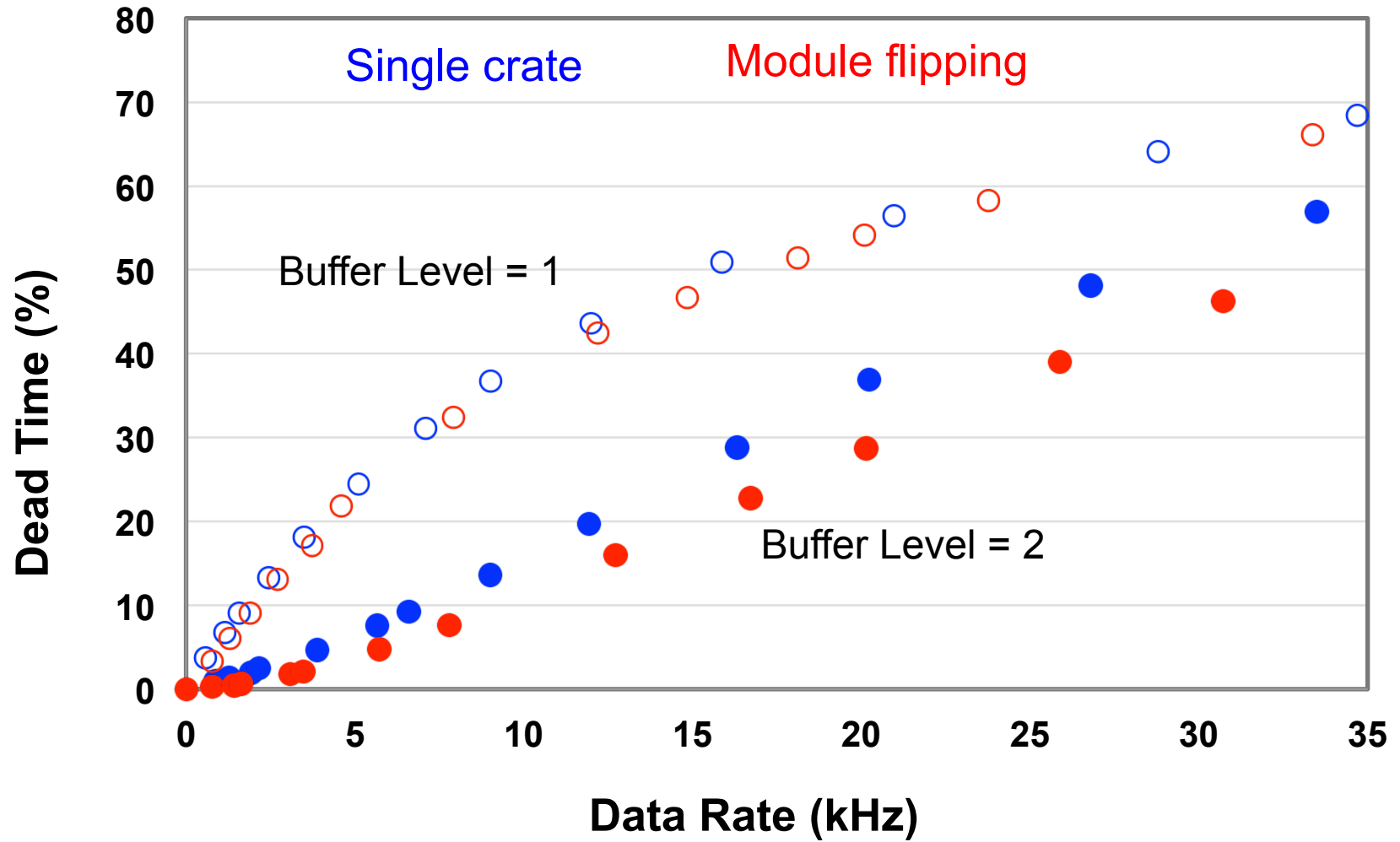
Input readout
trigger to TS

8 ADC
(no pedestal suppressed)



***Partially fixed with modification to the firmware.

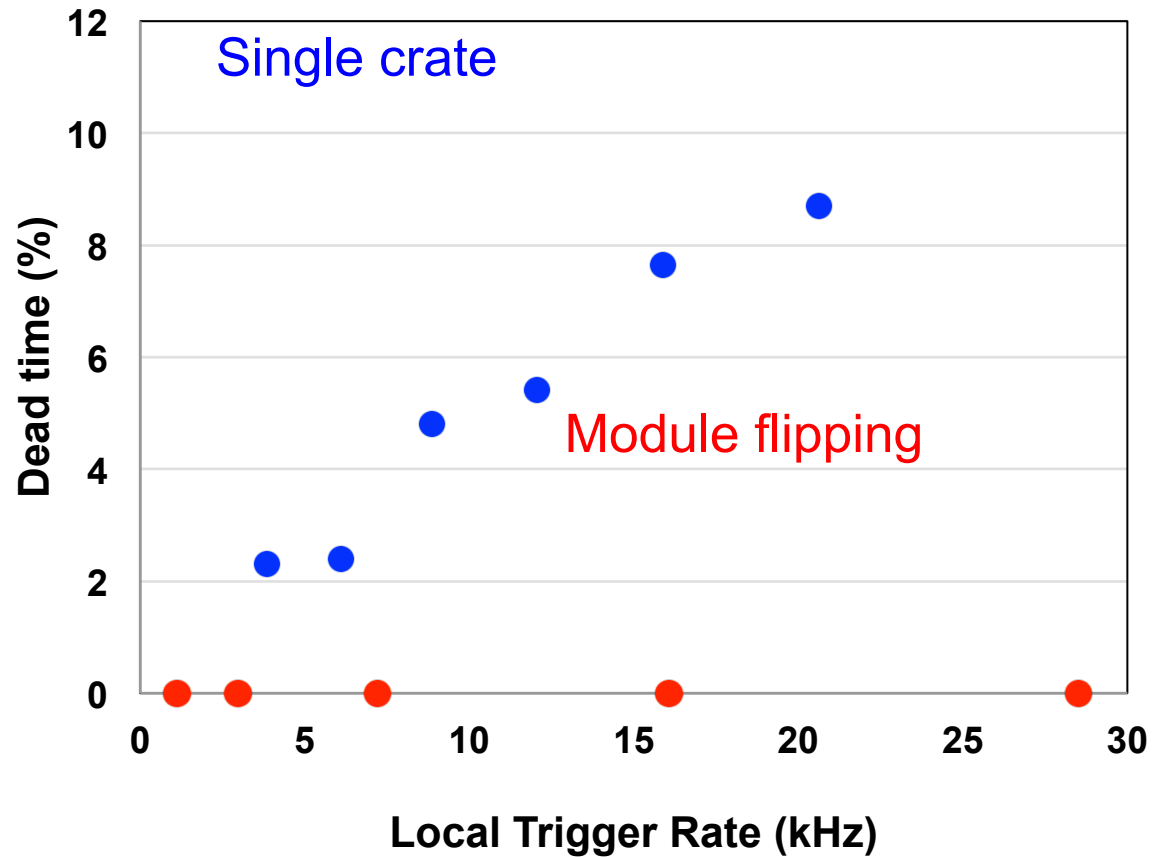
Readout trigger = Local trigger



Readout = cosmic and Local = source

Readout trigger rate ~5 Hz

Buffer Level = 1



- Reducing the dead time by reducing the front-end dead time

Future Plan

- Verify the the technique work for higher local trigger rates (100-200 kHz) with ~5kHz readout trigger.
- Need to test the event buffering and event blocking.
- Need to extend the module flipping technique for more Fastbus crates.
- Meantime, we are gathering/testing/making inventories of all the other Fastbus related modules
 - ATC, GAC, Signal Distribution Board, SFI, TI, CPU, ADCs
 - to fill 21 Fastbus crates (Ecal-12 and coordinate detector-9).

Thanks Alexander Camsonne, Robert Michaels, William Gu and Bryan Moffit for support and guidance.